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CHAPTER 1

INTRODUCTION

1.1 Background

Increasing fuel prices and strong environmental concerns have changed the competitive landscape of the shipping industry today. This present environment has rekindled an interest in improving efficiency and sustainability in the performance of ships. To meet with the changing commercial markets and the economic environment, there is the requirement for new vessel designs with more flexibility, longer lifespan, and with more energy efficient operating systems which will be highly cost effective.

The need to minimize operating costs is paramount in order to be competitive. The current oil fuel based energy source, at recent high prices, can result in fuel costs as high as 50 percent of the operating costs [1]. Alternative energy sources for power generation such as LNG, fuel cells, nuclear, wind assisted ships are now being considered by many shipping companies. Apart from the hull and propulsion efficiency, optimization of ship running costs and quality of services depend on the performance of the operational systems and processes such as voyage management, loading and maintenance.

As the MISC vision is to become a world class player in the shipping industry, alternative ways have to be discovered for ensuring a competitive edge in the shipping business. Such development procedures are illustrated in Appendix A. These procedures range from fuel oil consumption monitoring, voyage management and propeller polishing for increasing fuel efficiency and to reducing fuel consumption [10]. However there is no alternative study that has been done within the MISC group for reducing dependence on fossil fuel. Wind assisted shipping is to be considered as an alternative way to reduce fuel consumption and prevent further damage to the environment. Earlier studies have shown that with the current wind assisted system technology, annual savings of between 10 to 30 percent of fuel consumption can be expected [31].

This study will focus on the feasibility of a wind assisted system to be applied onboard a MISC ship. The wind assisted systems generate thrust from the wind and thereby reduce dependence on fossil fuel and main engine operation.

1.2 Statement of Problem

Maritime Shipping is nearly dependent on fuel oil. In the last 10 years, crude oil prices rose annually by 10 percent on the average and in 2009, a high upward movement has been observed. This development, places tremendous financial pressure on the shipping industry as the fuel oil cost accounts for more than half of a ship's operating cost. The International Energy Agency (IEA) has projected an average oil price of USD 200 per barrel by 2013. According to the IEA report the main reason for this price increase is the continuing decline in oil production rates by about 6-7 percent annually and faces a growing demand of 1 percent per year. Soon, shipping companies will be forced to reduce their sulfur emissions which are already damaging the environment at present. The maritime industry is responsible for almost 4 percent of the worldwide CO_2 emission. The only way to reduce the emission is by reducing the

burning of fuel. The way out of this crisis is by opening up alternative energy sources for the ships and this makes the use of free wind power more attractive.

1.3 Objective

The objective of this study is to develop a wind assisted propulsion system and to assess its techno economic feasibility.

1.4 Scope

The scope of this study covers the wind assisted propulsion system, the route and ship selection, the collection and compilation of wind data from noon reports, analyses of wind data of chosen routes, the development of wind assisted propulsion system, the calculation of power generated by wind and expected fuel savings, the assessment of techno economics with the application of the wind assisted propulsion system and finally the recommendations for further research work.

1.5 Outline of Thesis

This thesis comprises five chapters. Chapter one will cover the introduction and background of the study, the objective to study the wind assisted propulsion system and lastly the scope of the study. Chapter two covers the literature reviewed. There are three main parts in this chapter. Part one discusses the contribution of the wind assisted propulsion system to fuel saving and the effect of releasing CO_2 into the atmosphere by the shipping industry. The second part, discusses the previous study conducted for the wind assisted propulsion system and the application and advantages of the wind assisted propulsion system. In the third part, the kite sail theory and its application on the vessel are discussed. Chapter three covers the methodology and selection of the

vessels, the routes of study, method on actual data collection from the vessel, kite dimensions, cost estimation, a case study of a ship and lastly an investment appraisal will be determined. Chapter four contains the main discussion on the route analysis and the wind analysis for the launching of kites. This chapter also discusses the propulsion force derived by applying a kite on the vessel. By generating a case study, the total fuel savings on a chosen route can be determined as well as the emission of CO_2 can be reduced and furthermore an investment appraisal will be also discussed. Finally, in Chapter five, the conclusion on the objective of the study will be explained in brief and recommendations and suggestions for the improvement of the study or future research will be provided.